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THE MICROSTRUCTURE OF THE MAGNETIC STORMS IN
RESPECT OF PULSATIONS
(FOR THE FIRST EIGHT MONTHS OF THE IGY)

The study of magnetic storms microstructure in respect of pulsations was conducted in order:

1. to reveal additional storm characteristics which might be used for a more detailed storm classification;
2. to reveal special and characteristic periods during the storms in respect of pulsations with the aim to investigate their correlation and connection with other electro-magnetic phenomena;
3. to determine some parameters (periods of pulsations, their course of changing, etc.) which may be used in the theories of disturbed periods of the Earth's electro-magnetic field.

An analysis was carried out for the main storms (2-3.IX, 4.IX, 13.IX, 21.IX, 29.IX, 11.II) and for the two weaker storms on the 29.VIII and on the 6-7.XI. Ultra-rapid, 24-hour records of Earth currents (with a time scale of 1/2 mm per sec.) were used for this investigation.

In keeping with the IGY programme this type of records are conducted on all the 17 Earth currents stations (located in the Arctic, in the Antarctic and in the middle latitudes).

During the storm in the course of investigations the microstructure of S.C. of the storms (in respect of pulsations) and specific time intervals, with different types of pulsations and periods were determined.

An approximate microstructure scheme was made up for each storm and its validity for each station checked.

The microstructure of storms in respect of pulsations was studied in the 1-30 sec. period range.

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PRELIMINARY RESULTS

a) Microstructure of S.C.

The microstructure of the S.C. for abovementioned storms consisted for the most part of 2 to 4 more or less regular oscillations, with periods from 4 to 14 seconds.

Among the above, we can note the case of S.C. on the 22 September when the microstructure at many stations consisted of a series of regular intensive oscillations. It is interesting to note, that the same regular character of S.C. was registered on an induction magnetograph in Japan (Onagawa). Exceptions to this kind of regular microstructure for S.C. is for instance the case of 11/II. The microstructure of S.C. for this storm consisted of a series of irregular short-period oscillations (from 4 to 7 sec.) superimposed on long-period oscillations (from 20 to 40 seconds).

b) The main characteristic periods of storms.

The microstructure of the studied storms vary considerably in different cases. The preliminary data allow to divide the analysed storms into two main groups-- the storms with microstructure composed mainly of pulsations with small periods of 2 to 6 seconds (these pulsations can have either a very regular sinusoidal or rather irregular shape) and the storms with microstructure consisting mainly of continuous type pulsations (pc-type).

To the first group belong the storms which occurred on September 2-3, 4, 13, 22 & 11.II. To the second group belong those of September 21 and 29th. The microstructure of the storms of 29th Sept. and 6-7th November is mixed. The beginning of these storms belongs to the first group. Towards the ending of these storms a transition to the second group is observed (transition to the pc-type pulsations). The preliminary average data on the microstructure of the two magnetic storms (on the 4th and on the 29th of September) are given in the following Table.

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Table I

Date	Storm commence- ment	The first character- istic interval			The second charac- teristic interval			The third characteristic interval		
		Time interval	T period	type	time interval	T period	type	time interval	T period	type
4/IX	12 ⁵⁹	13-19	2-4 sec.	specific short period oscilla- tions	18-22	1.5-2 sec.	pearls ^{1/}	20-05	2-4 sec.	specific short period oscillations
29/IX	4 ⁰⁰ (S.C.-015)	4-7	10-15 sec.	pulsations of pc-type	17-20 ³⁰	1.5-2.5 pearls sec.				

The time indications in the above table are in Greenwich Time.

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The explanation to the pulsations of pearl-type is given below.

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For the study of the storm of 29th September, records of the following stations were used: two Arctic station-- Cape Chelyuskin and Lovozero; nine middle latitude stations -- Lvov, Borok, Alushta, Ashkhabad, Alma-Ata, Petropavlovsk-on-Kamchatka; and the two Antarctic stations-- Mirny and Oasis. The latitude difference for all these stations is $\Delta \varphi = 144^\circ$, and the longitude difference $\Delta \lambda = 126^\circ$.

For the analysis of the storm of September 4th, records of the following stations were used: the Arctic station-- Lovozero and four middle latitude stations-- Borok, Petropavlovsk-on-Kamchatka, Alushta and Ashkhabad. (The first interval of this storm in Alushta consisted of oscillations with somewhat greater periods than given in the Table).

c) The final stage of the storms

In studying the microstructure of magnetic storms in respect of pulsations it was discovered that for all the above-mentioned storms, the final stage consisted of specific short-periodic oscillations.

For five storms (September 4th., 13th., 21st., 22nd., and February 11th), these oscillations had an expressive form of the beating type oscillations, with periods falling in the range of 1.5 to 4 seconds. For their beauty and characteristic shape they were called "pearls". In two cases (the storms of 2-3rd September and the 4th September) the storms ended with characteristic oscillations with periods from 2 to 6 seconds and from 2 to 4 seconds. The less intensive storms of the 29th August and of the 6-7 November up to their end had no such characteristic transition to the short period oscillations.

CONCLUSIONS

The analysis of microstructure of magnetic storms in respect of pulsations (with periods from 1 to 30 sec. approximately) allows to make the following preliminary statements.

1. The microstructure of magnetic storms in respect of pulsations is different for different storms.
2. The most intensive storms which occurred in the first 8 months of the IGY might be divided in the first approximation

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into storms composed mainly of characteristic oscillations with short periods (from 2 to 6 sec) and storms consisting mainly of continuous pulsations (type pc) with periods 10-15 sec.

3. In the most of the studied cases the microstructure of sudden commencement of the storms consisted of more or less intensive oscillations (2-4 oscillations) with periods 8-14 sec.

4. The important peculiarity of the studied intensive storms is that by the end of the disturbed period occur characteristic short periodic oscillations of the beating type (called pearls) with periods $T \approx 1-4$ sec.

These oscillations have, evidently, a world wide distribution.

5. The main characteristic periods of storms in respect of pulsations can be traced with some modifications on all the network of the USSR Earth currents stations. (Including stations located in the located in the Arctic, Antarctic, middle latitudes of USSR and in the Far East).

These characteristic periods can be traced on different stations but the degree of correlation for these characteristic periods is different for different storms.

The revealed peculiarities of microstructure of the magnetic storms allow to use these quite new experimental facts for the analysis of intercorrelations in the complex of electromagnetic phenomena connected with the occurrence of magnetic storms.